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Contaminant Concentrations in Connecticut and Massachusetts Mink



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2 **PREFACE**

Information presented in this report is final documentation of the 1990 environmental contaminants evaluation of mink livers from Massachusetts and Connecticut under PACF Numbers FY90 6390 and 6391, Regional ID Number 90-5-006. Sample collection was performed by personnel from the Connecticut Department of Environmental Protection and the Massachusetts Department of Fisheries and Wildlife. Data analysis and reporting were completed by Environmental Contaminants personnel in the New England Field Offices, U.S. Fish and Wildlife Service, Department of the Interior.

Questions, comments, and suggestions related to this report are encouraged. Written enquiries should refer to Report Number RY91-NEFO-5-EC and be directed to the Service at the following address:

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INTRODUCTION

The mink (Mustela vison) is one of the most widely distributed furbearers in North America and is considered common throughout most of the New England states (DeStefano 1987). They are predominantly generalists and prey on locally available food sources. Where habitat quality is good, mink occupy between 0.5 - 5.5 km of shoreline (Eagle and Whitman 1987). Given their use of a relatively small area and their dependence on local prey, mink should be a good indicator of contaminant levels in local areas due to their extreme sensitivity to organic mercury compounds (Aulerich et al. 1974, Wobeser et al. 1976, Wren et al. 1987) and PCB's (Platonow and Karstad 1973, O'Shea et al. 1981). Our first objective (Study ID No. 89-5-059) was to survey Hg and organochlorine levels in various watersheds in Connecticut and Massachusetts.

Between 1982 to 1985, mink harvest declined noticeably in Connecticut. Since then, the mink harvest has been unpredictable, fluctuating up and down independent of other furbearer harvests (Paul Rego pers. comm.). Our second objective (Study ID No. 90-5-006) was to determine if contaminant levels were high enough to adversely influence mink populations in Connecticut.

METHODS

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Mink carcasses were collected by the Connecticut Department of Environmental Protection and the Massachusetts Department of Fisheries and Wildlife from licensed fur trappers during the early winter of 1987 (CT), 1988 (CT), and 1989 (MA). Liver tissue samples were removed using procedures described by Organ (1989). A minimum of five grams of liver tissue from each mink was sent to the Environmental Trace Substances Research Center in Columbia, Missouri for mercury analysis. A minimum of five grams of liver tissue from each mink was also sent to the Mississippi State Chemical Laboratory for organochlorine pesticides and PCB analysis.

Mean contaminant levels by watershed were calculated two ways. Low values assumed that none detected (ND) levels equaled zero for the purpose of analysis. High values assumed that ND levels equaled 1/2 the detection limit. Due to the non-normal distribution of data, a \log_{10} transformation was performed on high values and these were used for further analysis. Least squares ANOVA was used to compare differences among watersheds and independent T-tests were used to compare differences between states. Contour maps of the various contaminants found in Connecticut mink were generated using an inverse distance squared relationship, modified using a cubic spline smoothing matrix, and plotted within a rough outline of the state.

RESULTS

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Mercury

Mean Connecticut mercury levels by watershed ranged from 1.1 ppm (n=2) in the Yantic basin (39) to 8.47 ppm (n=6) in the Shepaug basin (67) (Table 1; Appendix 1). There was no significant difference in geometric mean levels between watersheds. Individual Hg levels ranged from none detected (ND) to 31.0 ppm (Appendix 4). Inverse distance squared analysis predicted elevated Hg levels in the Housatonic and western Thames major basins (Figure 1). Overall Hg levels in Connecticut (5.17 ppm) were significantly higher than those in Massachusetts (0.84 ppm) ($T = 4.36$, $df = 132$, $p = 0.00$).

Mean Massachusetts mercury levels by watershed ranged from 0.008 ppm (n=2) in the Hudson basin (1) to 1.92 ppm (n=2) in the Taunton basin (25) (Table 1; Appendix 2). There was no significant difference in geometric mean levels between watersheds. Individual Hg levels ranged from ND to 4.1 ppm (Appendix 4).

Chlordanes

Mean Connecticut chlordane levels by watershed ranged from 0.19 ppm (n=4) in the Pachaug basin (36) to 1.50 ppm (n=11) in the Willimantic basin (31) (Table 2; Appendix 1). There was no significant difference in geometric mean levels between watersheds. Individual chlordane levels ranged from ND to 1.38 ppm (Appendix 5). Inverse distance squared analysis predicted elevated chlordane levels in the western Thames major basin (Figure 2). Overall chlordane levels in Connecticut (0.27 ppm) were significantly higher than those in Massachusetts (0.11 ppm) ($T = 4.24$, $df = 132$, $p = 0.00$).

Mean Massachusetts chlordane levels by watershed ranged from 0.05 ppm (n=2) in the Buzzard's Bay basin (24) to 0.56 ppm (n=6) in the Taunton basin (25) (Table 2; Appendix 2). There was no significant difference in geometric mean levels between watersheds. Individual chlordane levels ranged from ND to 0.54 ppm (Appendix 5).

DDT

Mean Connecticut DDT levels by watershed ranged from 0.10 ppm (n=2) in the eastern South Central Coast basin (51) to 0.49 ppm (n=10) in the Natchaug basin (32) (Table 2; Appendix 1). There was no significant difference in geometric mean levels between watersheds. Individual DDT levels ranged from ND to 0.44 ppm (Appendix 6). Inverse distance squared analysis predicted elevated DDT levels in the upper Connecticut and western Thames major basins (Figure 3). Overall DDT levels in Connecticut (0.10 ppm) were significantly higher than those in Massachusetts (0.055 ppm) ($T = 3.91$, $df = 132$, $p = 0.00$).

Mean Massachusetts DDT levels by watershed ranged from 0.03 ppm (n=3) in the Hudson basin (1) to 0.17 ppm (n=6) in the Taunton basin (25) (Table 2; Appendix 2). There was no significant difference in geometric mean levels between watersheds. Individual DDT levels ranged from ND to 0.16 ppm (Appendix 6).

PCB

Mean Connecticut PCB levels by watershed ranged from 0.94 ppm (n=3) in the Pomperaug basin (68) to 10.0 ppm in the Quinebaug (37, n=16) and western South Central Coast (53, n=4) basins (Table 2; Appendix 1). There was no

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Table 1. Mean mercury concentrations (ppm-wet weight) in mink livers from various watersheds in Connecticut and Massachusetts.

WATER SHED NO. ^a	(N)	MERCURY			
		LOW ^b		HIGH ^c	
		\bar{x}	SE	\bar{x}	SE
CONNECTICUT					
21	1	6.320	-	6.320	-
22	1	3.20	-	3.200	-
31	11	8.590	2.868	8.590	2.868
32	10	3.384	0.474	3.384	0.474
33	3	6.370	1.092	6.370	1.092
34	4	5.345	0.507	5.345	0.507
35	1	10.40	-	10.400	-
36	4	4.463	0.763	4.463	0.763
37	16	4.029	1.160	4.030	1.159
38	4	5.500	2.323	5.500	2.323
39	2	1.110	0.390	1.110	0.390
40	1	7.90	-	7.900	-
42	3	2.371	0.865	2.371	0.865
43	13	4.653	1.119	4.653	1.119
44	1	9.590	-	9.950	-
47	1	19.00	-	19.00	-
51	2	4.465	4.465	4.465	4.465
52	1	3.900	-	3.900	-
53	4	2.000	0.512	2.000	0.512
60	6	4.850	1.994	4.850	1.994
62	2	7.880	2.520	7.880	2.520
67	6	8.467	4.476	8.467	4.476
68	3	4.567	3.080	4.567	3.080
69	3	0.800	0.416	0.800	0.416
MASSACHUSETTS					
1	3	0.000	0.000	0.008	0.008
2	7	0.663	0.279	0.663	0.279
4	3	0.000	0.000	0.008	0.000
5	1	0.000	-	0.008	-
7	2	1.380	1.380	1.388	1.376
13	2	1.580	1.580	1.580	1.580

Table 1 (continued).

19	1	0.790	-	0.790	-
24	2	0.540	0.150	0.540	0.150
25	6	1.917	0.616	1.921	0.613

^aSee Appendices 1 and 2.

^bNone detected levels = 0.

^cNone detected levels = 1/2 the detection limit (0.025 ppm).

Figure 1. Liver Mercury levels in Connecticut mink.

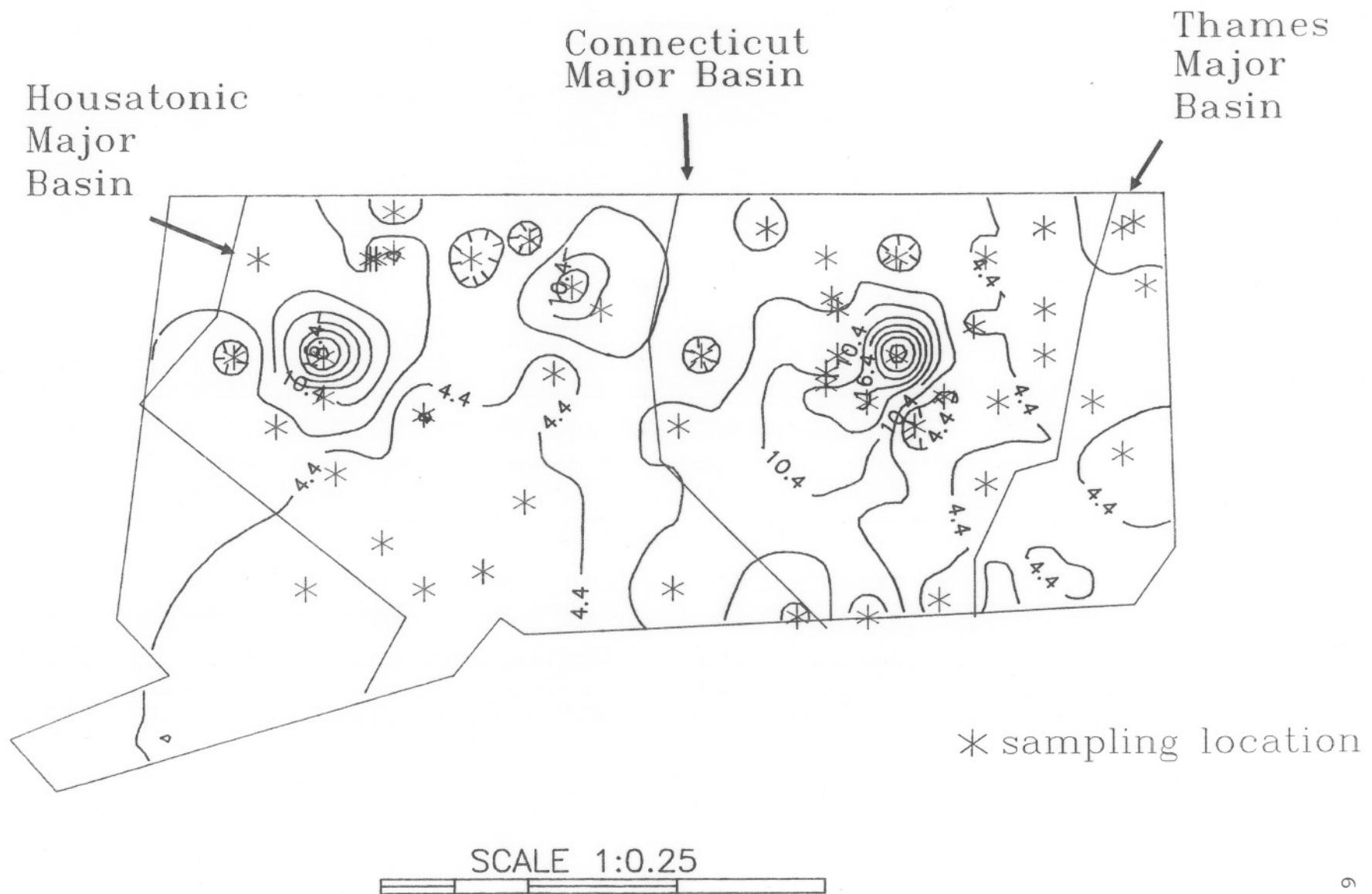


Table 2. Mean chlordane, DDT, and PCB concentrations (ppm-wet weight) in mink livers from various watersheds in Connecticut and Massachusetts.

WATER SHED NO. ^a	(N)	CHLORDANE				DDT				PCB			
		LOW ^b		HIGH ^c		LOW		HIGH		LOW		HIGH	
		\bar{x}	SE	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE
CONNECTICUT													
21	1	0.060	-	0.190	-	0.080	-	0.130	-	2.680	-	2.680	-
22	1	0.330	-	0.460	-	0.050	-	0.100	-	2.400	-	2.400	-
31	11	0.331	0.139	1.500	0.137	0.010	0.007	0.110	0.003	1.465	0.444	4.250	0.422
32	10	0.120	0.051	0.670	0.050	0.044	0.044	0.490	0.041	0.634	0.197	1.440	0.163
33	3	0.107	0.107	0.440	0.097	0.033	0.033	0.150	0.023	2.063	1.083	4.210	1.083
34	4	0.143	0.070	0.430	0.060	0.020	0.020	0.130	0.013	1.448	0.470	2.590	0.470
35	1	0.330	-	0.460	-	0.090	-	0.140	-	1.850	-	1.850	-
36	4	0.028	0.016	0.190	0.010	-	-	0.080	-	1.483	0.625	2.970	0.577
37	16	0.068	0.021	0.380	0.019	0.020	0.007	0.130	0.004	2.621	0.636	10.00	0.619
38	4	0.080	0.040	0.310	0.034	-	-	0.080	-	1.778	0.380	2.410	0.380
39	2	0.045	0.045	0.220	0.035	0.050	0.050	0.150	0.035	2.390	0.860	3.250	0.860
40	1	0.500	-	0.630	-	0.100	-	0.150	-	5.040	-	5.040	-
42	3	0.187	0.043	0.380	0.049	0.033	0.033	0.150	0.023	1.717	0.602	2.920	0.602
43	13	0.133	0.055	0.700	0.050	0.058	0.033	0.450	0.028	0.658	0.214	2.160	0.186
44	1	-	-	0.150	-	-	-	0.080	-	0.570	-	0.570	-
47	1	0.250	-	0.350	-	0.090	-	0.140	-	0.990	-	0.990	-
51	2	0.200	0.030	0.330	0.015	0.025	0.025	0.100	0.010	1.175	0.285	1.460	0.285
52	1	0.220	-	0.320	-	0.180	-	0.230	-	1.130	-	1.130	-

Table 2 (continued).

53	4	0.083 0.051	0.340 0.046	0.085 0.037	0.230	0.031	3.193	2.299	10.00	2.271
60	6	0.087 0.048	0.430 0.045	0.035 0.011	0.110	0.005	0.587	0.293	1.550	0.244
62	2	0.145 0.005	0.250 0.005	- -	0.080	-	1.950	0.700	2.650	0.700
67	6	0.077 0.077	0.590 0.073	0.040 0.020	0.170	0.014	0.418	0.204	1.130	0.155
68	3	0.117 0.080	0.400 0.076	0.037 0.019	0.110	0.009	0.610	0.305	0.940	0.222
69	3	0.163 0.083	0.370 0.069	0.033 0.033	0.150	0.023	1.820	0.418	2.470	0.418
MASSACHUSETTS										
1	3	0.060 0.015	0.120 0.018	0.017 0.003	0.030	0.003	0.203	0.203	0.610	0.193
2	7	0.036 0.004	0.080 0.006	0.020 0.005	0.060	0.005	0.089	0.089	0.620	0.084
4	3	0.030 0.017	0.090 0.018	0.057 0.037	0.140	0.037	0.780	0.574	1.900	0.567
5	1	0.020 -	0.040 -	0.040 -	0.050	-	-	-	0.030	-
7	3	0.077 0.037	0.160 0.033	0.073 0.019	0.120	0.019	1.583	1.272	4.100	1.266
13	2	0.045 0.025	0.090 0.025	0.015 0.005	0.030	0.005	0.750	0.750	1.500	0.735
19	1	0.030 -	0.050 -	0.090 -	0.100	-	-	-	0.030	-
24	2	0.025 0.005	0.050 0.005	0.020 -	0.030	-	0.405	0.035	0.440	0.035
25	6	0.237 0.089	0.560 0.088	0.085 0.022	0.170	0.022	0.778	0.275	1.990	0.272
28	3	0.083 0.030	0.170 0.033	0.037 0.018	0.080	0.018	0.680	0.465	1.570	0.458

^aSee Appendices 1 and 2.^bNone detected levels = 0^cNone detected levels = 1/2 the detection limit (0.025 ppm for Chlordane and DDT, 0.25 ppm for PCB).

Figure 2. Liver Chlordane levels in Connecticut mink.

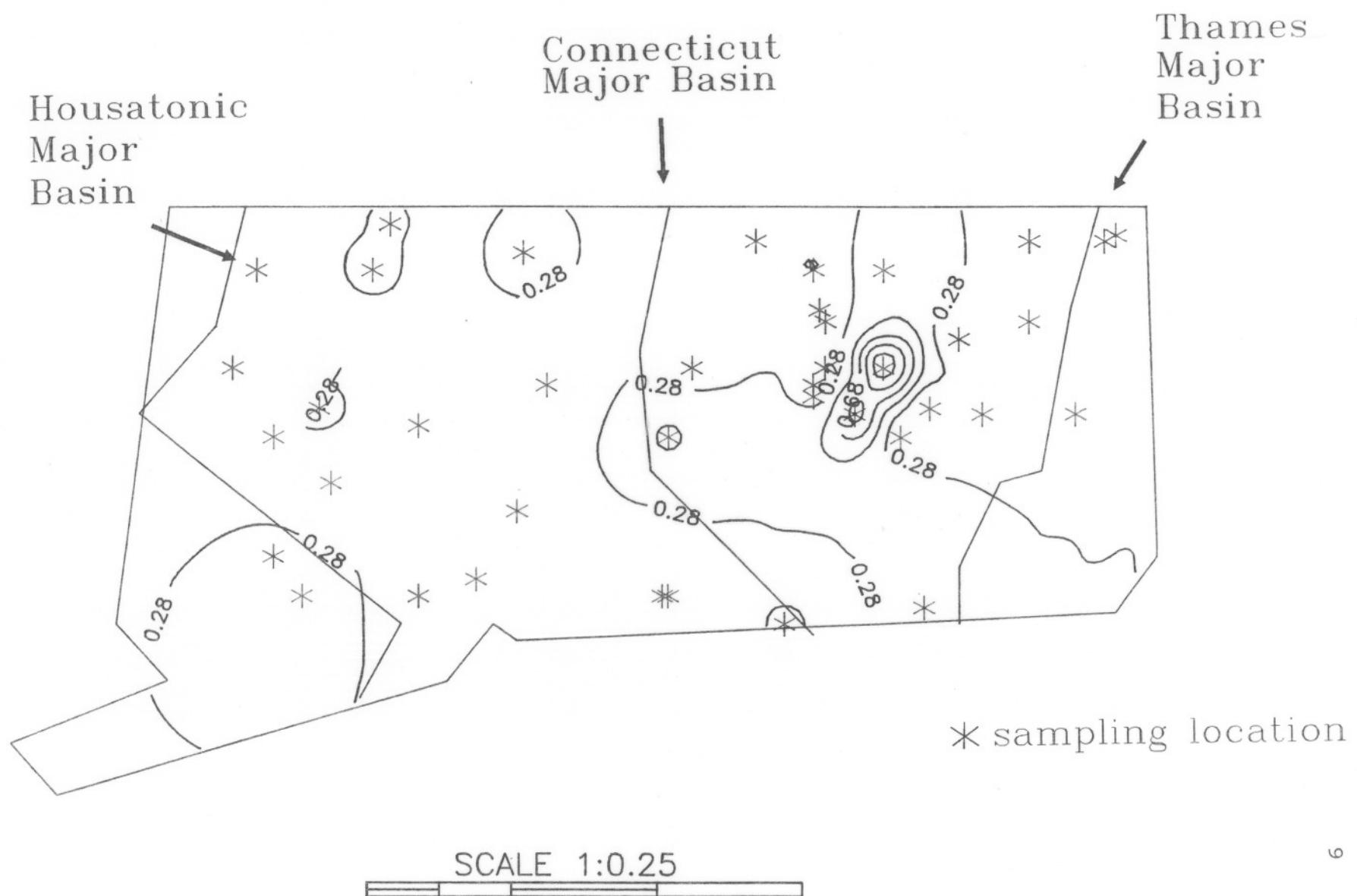
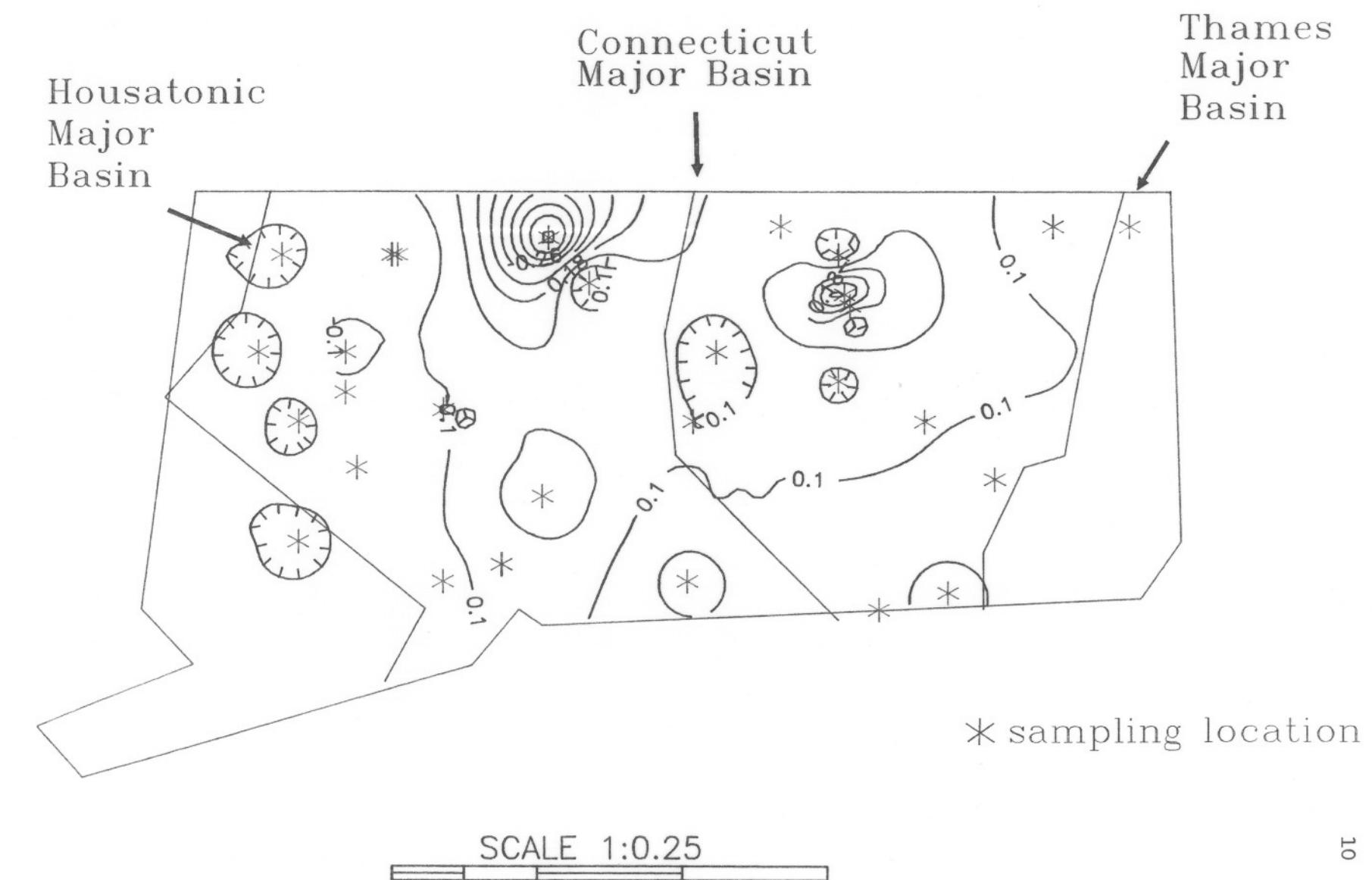


Figure 3. Liver DDT levels in Connecticut mink.



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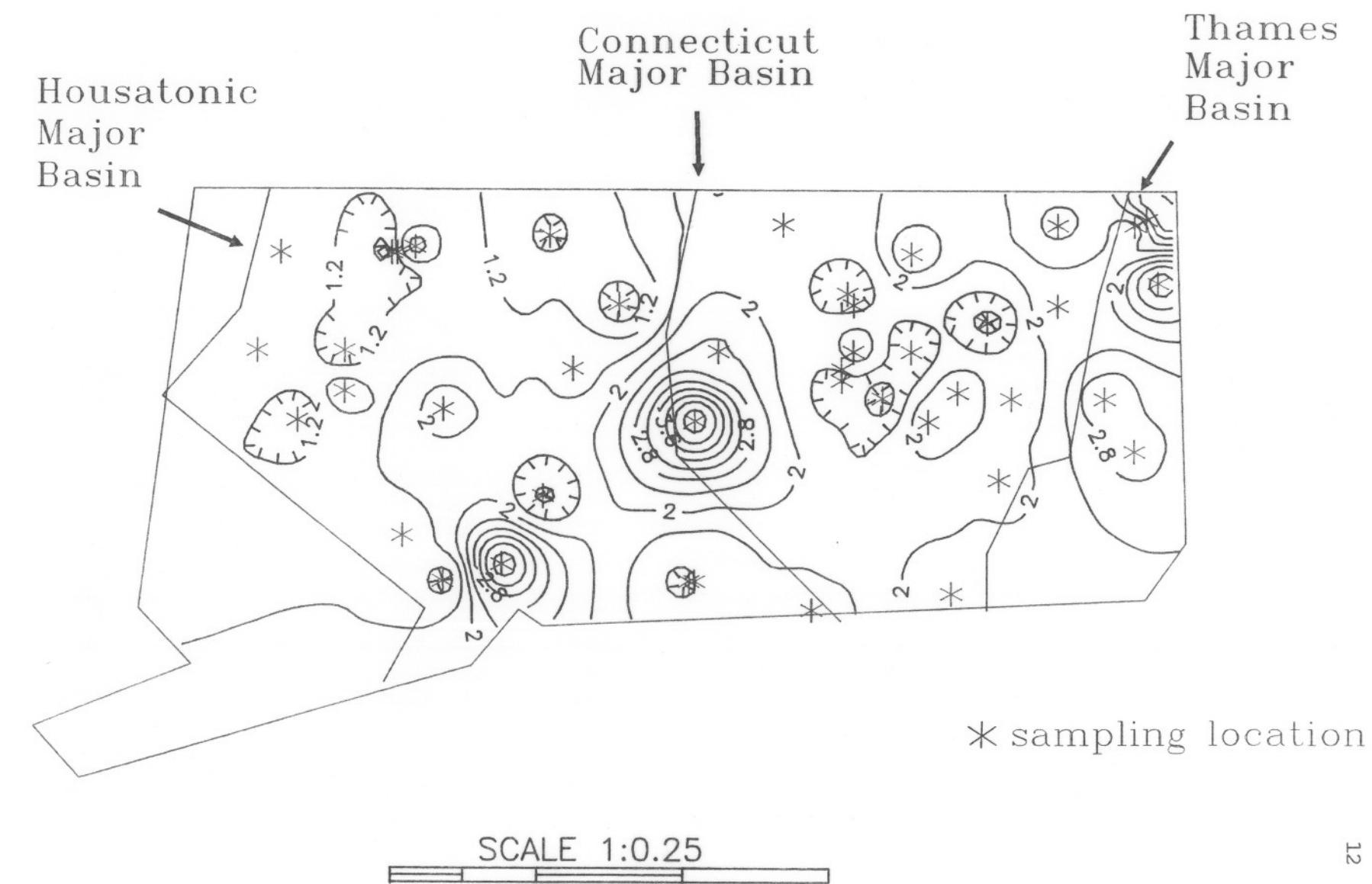
significant difference in geometric mean levels between watersheds. Individual PCB levels ranged from ND to 11.2 ppm (Appendix 6). Inverse distance squared analysis predicted elevated PCB levels in the Connecticut and Southwest Coast major basins (Figure 4). Overall PCB levels in Connecticut (1.58 ppm) were significantly higher than those in Massachusetts (0.57 ppm) ($T = 3.11$, $df = 132$, $p = 0.002$).

Mean Massachusetts PCB levels by watershed ranged from 0.44 ppm ($n=2$) in the Buzzard's Bay basin (24) to 4.1 ppm ($n=3$) in the Miller's basin (7) (Table 2; Appendix 2). There was no significant difference in geometric mean levels between watersheds. Individual PCB levels ranged from ND to 4.1 ppm (Appendix 6).

DIELDRIN

Mean Connecticut dieldrin levels by watershed ranged from 0.040 ppm ($n=3$) in the Naugatuck basin (69) to 0.13 ppm ($n=3$) in the French basin (33) (Table 3; Appendix 1). There was no significant difference in geometric mean levels between watersheds. Individual dieldrin levels ranged from ND to 0.33 ppm (Appendix 7). Overall dieldrin levels in Connecticut (0.038 ppm) were not significantly different than those in Massachusetts (0.042 ppm).

Figure 4. Liver PCB levels in Connecticut mink.



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Table 3. Mean dieldrin, endrin and mirex concentrations (ppm-wet weight) in mink livers from various watersheds in Connecticut and Massachusetts.

WATER SHED NO. ^a	(N)	DIELDRIN				ENDRIN				MIREX			
		LOW ^b		HIGH ^c		LOW		HIGH		LOW		HIGH	
		\bar{x}	SE	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE	\bar{x}	SE
CONNECTICUT													
21	1			0.030	-			0.030	-			0.030	-
22	1	0.100	-	0.100	-	0.000	-	0.030	-	0.000	-	0.030	-
31	11	0.018	0.013	0.043	0.010	0.000	-	0.030	-	0.000	-	0.030	-
32	10	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
33	3	0.110	0.110	0.130	0.100	0.000	-	0.030	-	0.000	-	0.030	-
34	4	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
35	1	0.100	-	0.100	-	0.000	-	0.030	-	0.000	-	0.030	-
36	4	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
37	16	0.057	0.019	0.074	0.016	0.000	-	0.030	-	0.005	0.005	0.033	0.003
38	4	0.038	0.038	0.060	0.030	0.000	-	0.030	-	0.000	-	0.030	-
39	2	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
40	1	0.080	-	0.080	-	0.000	-	0.030	-	0.000	-	0.030	-
42	3	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
43	13	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
44	1	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
47	1	0.000	-	0.030	-	0.000	-	0.030	-	0.000	-	0.030	-
51	2	0.030	0.030	0.045	0.015	0.000	-	0.030	-	0.000	-	0.030	-
52	1	0.080	-	0.080	-	0.000	-	0.030	-	0.000	-	0.030	-

Table 3 (continued).

53	4	0.000 -	0.030 -	0.000 -	0.030 -	0.000 -	0.030 -	0.030 -	0.030 -
60	6	0.000 -	0.030 -	0.000 -	0.030 -	0.000 -	0.030 -	0.030 -	0.030 -
62	2	0.000 -	0.030 -	0.000 -	0.030 -	0.000 -	0.030 -	0.030 -	0.030 -
67	6	0.000 -	0.030 -	0.000 -	0.030 -	0.000 -	0.030 -	0.030 -	0.030 -
68	3	0.030 -	0.050 0.020	0.000 -	0.030 -	0.000 -	0.030 -	0.030 -	0.030 -
69	3	0.020 0.020	0.040 0.010	0.000 -	0.030 -	0.020 0.020	0.040 0.010		
MASSACHUSETTS^d									
1	3	0.010 0.006	0.010 0.006	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
2	7	0.000 -	0.005 -	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
4	3	0.003 0.003	0.003 0.003	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
5	1	0.010 -	0.010 -	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
7	3	0.000 -	0.005 -	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
13	2	0.005 0.005	0.005 0.005	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
19	1	0.000 -	0.005 -	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
24	2	0.005 0.005	0.005 0.005	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
25	6	0.115 0.025	0.115 0.025	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -
28	3	0.033 0.013	0.005 -	0.000 -	0.005 -	0.000 -	0.005 -	0.005 -	0.005 -

^aSee Appendices 1 and 2.^bNone detected levels = 0.^cNone detected levels = 1/2 the detection limit (0.025 ppm).^dLower limit of detection for MA samples was 0.01 ppm.

DISCUSSION

Mercury

Of 16 adult mink fed 1.0 ppm methylmercury daily, nine animals died as a result of a synergistic interaction of MeHg and cold stress (Wren *et al.* 1987). Mean total liver Hg levels in the mortalities were 41.1 ppm (females) and 36.7 ppm (males). The range of mean mink liver Hg levels in Connecticut watersheds (1.1 - 8.47 ppm) are similar to those found in Manitoba (1.05 - 7.45 ppm) (Kucera 1983) and higher than those found in Ontario (0.14 - 2.55 ppm) (Wren *et al.* 1986). At least two mink in this study had mercury levels that approached a toxic exposure level (31 and 28 ppm), and eight individuals had mercury levels over 15 ppm. To our knowledge, there have been no studies that determine at what level Hg begins to adversely affect reproduction in mink. Mean mercury levels in Massachusetts (0.008 - 1.92 ppm) appear low when compared to other areas.

Chlordane

Little is known about the effects of chlordane on mink. Mice fed 50 ppm chlordane had a higher incidence of hepatocellular carcinoma than did controls (EPA 1980). Mink fed diets that contained 25 ppm heptachlor daily for 28 days resulted in a significant decrease in food consumption and 50 ppm resulted in significant loss of body weight (Aulerich *et al.* 1990). Levels in both Connecticut and Massachusetts (Appendix 5) appear higher than those found in Alberta. River otters (*Lutra canadensis*) from Alberta had cis-chlordane levels of 0.006 ppm and oxychlordane levels of 0.013 ppm (Somers *et al.* 1987). Trans-nonachlor levels in both states were generally lower than levels detected in otters from the Columbia River (0.17 - 0.25 ppm) (Henny *et al.* 1981).

DDT

Although DDT and its metabolites have been shown to cause reproductive failure in predatory birds at fairly low levels (Wiemeyer *et al.* 1984), it has not been implicated in toxicity to wild mammals (Wren 1987). Mink appear less sensitive to DDT than to other contaminants. There was no effect on mink reproduction when individuals were fed 100 ppm DDT (Duby 1970). Levels of DDE in Connecticut (ND - 0.44 ppm) and Massachusetts (ND - 0.13) mink appear similar to those found in Maryland (O'Shea *et al.* 1981), and lower than those found in Oregon (Henny *et al.* 1981).

PCB

Mink are extremely sensitive to PCB. Mink fed diets containing 0.64 ppm PCB had liver levels of 0.87 to 1.33 ppm after 160 days and exhibited reproductive failure due to embryo mortality and poor kit survival (Platonow and Karstad 1973). Only one of 12 females produced a litter and two of the females died. Female mink fed Great Lakes carp (*Cyprinus carpio*) with a 1.5 ppm Aroclor concentration did not produce any offspring that survived longer than 24 hours (Hornshaw *et al.* 1983). It appears that Connecticut mink PCB levels in almost every watershed sampled (0.94 - 10.0 ppm) are high enough to inhibit reproduction. Mean PCB levels in Connecticut (1.58 ppm) are similar to those found in Maryland (O'Shea *et al.* 1981). Although Massachusetts PCB levels are significantly lower than those in Connecticut, five of the ten watersheds sampled had PCB levels high enough (> 1.5 ppm) to inhibit reproduction.

DIELDRIN

Dieldrin levels in both Connecticut and Massachusetts appear relatively low. Overall dieldrin levels (0.038 and 0.042 ppm respectively) are similar to levels found in Maryland mink (O'Shea et al. 1981) and Alberta otters (Somers et al. 1987).

CONCLUSIONS

It appears that PCB levels in Connecticut and Massachusetts mink are high enough to adversely affect reproduction. Although levels of contaminants in Massachusetts were lower than those found in Connecticut, most of the samples from Massachusetts came from either the eastern or western part of the state, and areas that have potentially higher levels of contaminants are not represented. A more representative mink sample would have to be collected from Massachusetts in order to confirm contaminant levels.

We did not find statistically significant differences in contaminant levels between watersheds within states. We attribute this to our small sample sizes and the high variability in the data. It is possible that larger sample sizes would have shown significant statistical differences between watersheds.

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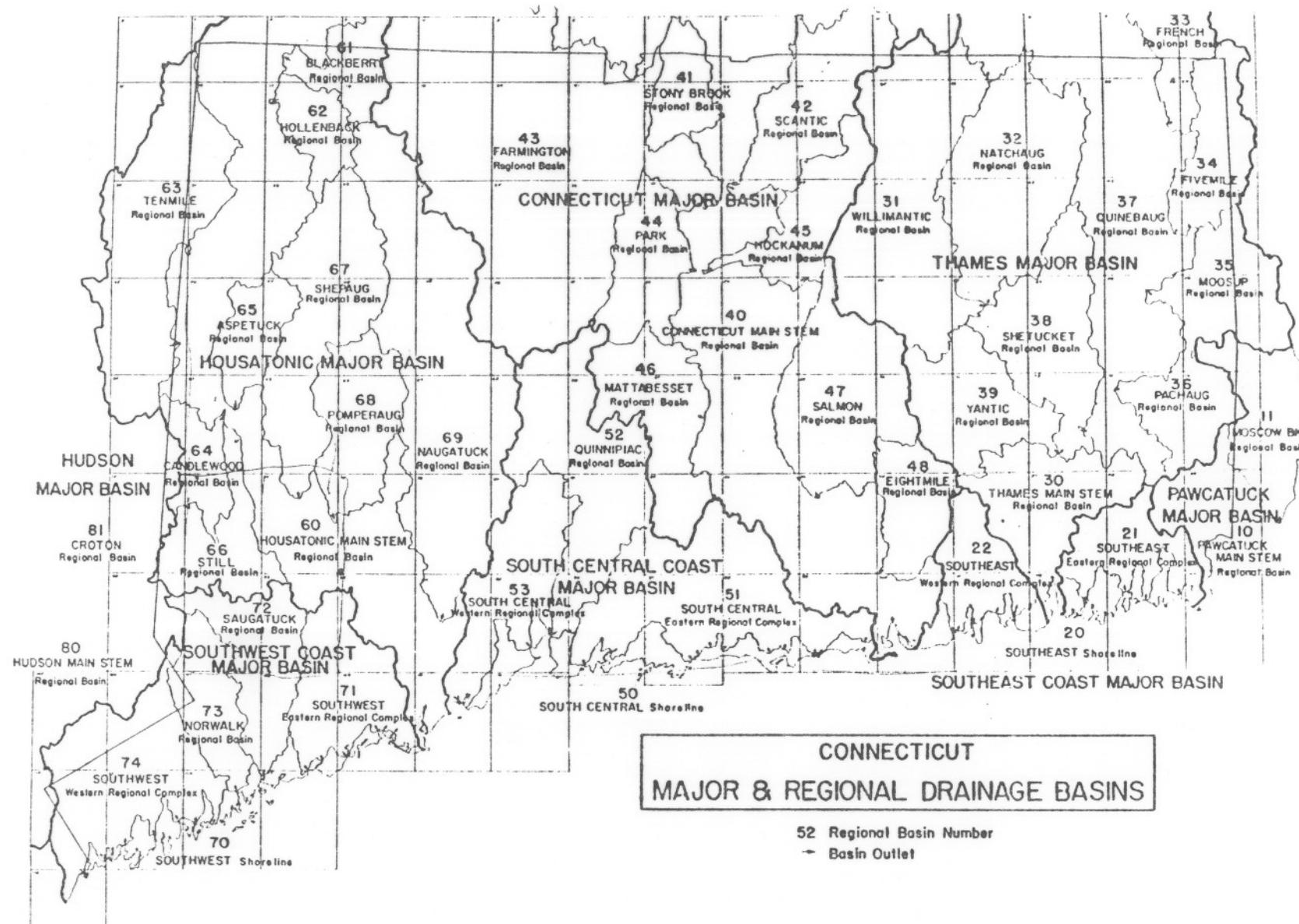
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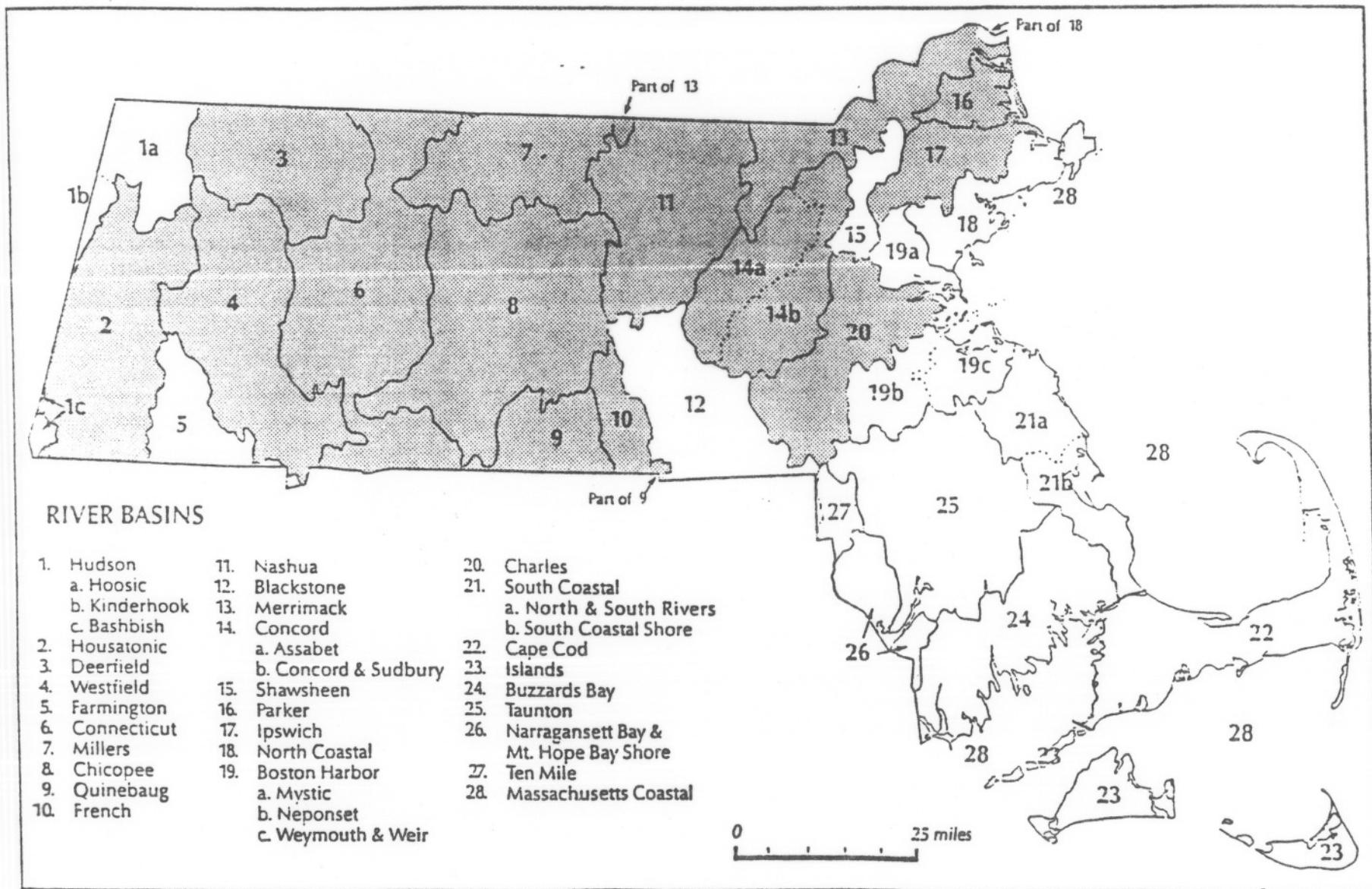
Appendix 1. Map of Connecticut showing the major and regional basins.



CONNECTICUT
MAJOR & REGIONAL DRAINAGE BASINS

Appendix 2. Map of Massachusetts showing the regional basins.
(Map taken from USFWS 1988)

FIGURE 1. RIVER BASINS IN MASSACHUSETTS



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Appendix 3. Mink capture location, animal ID number, sex, and tissue sample data used in contaminant analysis.

ST	WS# ^a	Town	ID #	Sex ^b	Wt(gm)	Moist	Lipid(%)
CT	21	137	85027	1	0.51	67.4	2.69
CT	22	45	85008	1	0.55	66.2	4.30
CT	31	1	86017	1	0.50	68.5	3.46
CT	31	1	85022	2	0.52	65.2	2.83
CT	31	1	87089	1	0.51	65.3	3.16
CT	31	30	86001	2	0.53	65.4	7.25
CT	31	32	86027	1	0.51	64.2	4.36
CT	31	32	86002	2	0.51	66.9	4.05
CT	31	32	86003	1	0.51	50.5	3.40
CT	31	78	87030	1	0.51	63.5	3.93
CT	31	142	86049	1	0.49	67.3	3.92
CT	31	142	86046	1	0.51	60.1	2.22
CT	31	160	86085	1	0.51	66.6	3.32
CT	32	3	87006	1	0.60	67.8	2.86
CT	32	3	85005	1	0.51	67.3	2.47
CT	32	3	85028	1	0.50	62.2	6.05
CT	32	3	87005	1	0.54	65.4	2.43
CT	32	3	87062	1	0.50	65.1	6.22
CT	32	24	86092	1	0.53	63.6	7.97
CT	32	24	86093	1	0.52	64.5	2.91
CT	32	24	86091	2	0.56	64.4	2.92
CT	32	39	87090	1	0.51	65.3	2.55
CT	32	39	87091	2	0.51	67.2	2.33
CT	33	141	87031	2	0.49	63.2	3.82
CT	33	169	86025	1	0.54	66.0	7.89
CT	33	169	86026	1	0.52	64.8	2.99
CT	34	69	86103	1	0.53	65.9	2.70
CT	34	116	87018	1	0.56	66.7	3.29
CT	34	116	87017	2	0.49	61.4	3.02
CT	34	141	86074	1	0.51	65.0	5.62
CT	35	87	86042	1	0.53	58.7	2.66
CT	36	58	87093	1	0.51	68.0	2.16
CT	36	147	86014	1	0.51	64.6	5.05
CT	36	147	86019	1	0.51	62.9	3.44
CT	36	147	86050	1	0.52	63.7	3.99
CT	37	19	87011	1	0.62	65.6	1.94
CT	37	22	87068	1	0.51	65.1	1.80
CT	37	22	87064	1	0.52	66.6	2.88
CT	37	109	87012	1	0.53	65.7	3.35
CT	37	112	86032	1	0.50	65.3	3.74
CT	37	112	86020	1	0.51	66.0	2.85
CT	37	114	87092	1	0.53	64.8	2.53
CT	37	114	86039	1	0.51	66.1	2.50
CT	37	141	87020	1	0.49	67.9	2.73
CT	37	141	87019	2	0.49	66.9	1.95
CT	37	169	86086	1	0.51	66.8	4.25
CT	37	169	86102	1	0.48	64.8	1.81
CT	37	169	86100	1	0.51	62.9	2.81

Appendix 3 (continued). Mink capture location, animal ID number, sex, and tissue sample data used in contaminant analysis.

ST	WS# ^a	Town	ID #	Sex ^b	Wt(gm)	Moist	Lipid(%)
CT	37	169	87040	1	0.54	70.5	1.99
CT	37	-	88046	2	0.50	68.7	2.59
CT	37	-	86028	1	0.53	67.2	5.29
CT	38	22	86041	1	0.50	62.3	3.31
CT	38	123	87026	1	0.51	65.9	2.83
CT	38	162	85021	1	0.51	63.0	4.65
CT	38	163	86056	1	0.54	62.5	4.19
CT	39	71	86029	1	0.52	66.9	3.49
CT	39	71	86030	1	0.52	70.8	2.23
CT	40	113	87094	1	0.52	68.6	2.10
CT	42	48	87024	1	0.51	71.2	2.88
CT	42	48	87023	1	0.49	62.3	5.87
CT	42	48	87025	1	0.52	67.5	2.30
CT	43	5	86069	2	0.52	66.1	3.26
CT	43	29	85017	1	0.53	63.6	4.72
CT	43	52	87082	2	0.52	65.2	2.43
CT	43	52	87083	1	0.51	67.1	2.63
CT	43	56	86065	1	0.53	65.9	3.84
CT	43	56	86096	2	0.50	69.6	1.95
CT	43	56	86094	1	0.52	64.9	3.23
CT	43	128	86063	1	0.52	65.3	4.68
CT	43	132	87029	1	0.53	64.5	4.37
CT	43	143	87043	2	0.52	64.8	1.88
CT	43	143	87046	2	0.50	70.0	1.73
CT	43	143	87066	1	0.53	60.4	3.21
CT	43	-	86095	1	0.53	65.1	3.06
CT	44	155	86105	1	0.52	65.4	2.05
CT	47	67	87032	1	0.51	66.0	4.04
CT	51	70	87088	1	0.51	64.8	2.70
CT	51	76	86089	1	0.50	64.8	3.08
CT	52	25	87084	2	0.50	66.4	1.86
CT	53	62	87007	1	0.48	65.6	5.80
CT	53	62	86040	1	0.51	66.6	3.79
CT	53	62	87008	1	0.55	66.3	2.03
CT	53	167	87073	1	0.52	65.0	2.77
CT	60	31	87041	1	0.54	66.1	2.29
CT	60	97	88064	1	0.48	66.2	2.56
CT	60	108	87063	1	0.52	65.3	2.13
CT	60	125	85001	1	0.53	63.0	3.94
CT	60	149	86064	1	0.46	65.7	2.11
CT	60	149	86090	1	0.50	63.9	3.24
CT	62	31	87038	1	0.52	65.7	2.70
CT	62	31	87039	2	0.51	64.9	1.48
CT	67	55	87004	1	0.47	59.3	3.22
CT	67	55	87065	1	0.52	67.8	1.90
CT	67	55	87059	2	0.55	65.7	2.48
CT	67	74	86097	2	0.50	37.3	1.46
CT	67	74	87086	1	0.51	65.7	3.39

Appendix 3 (continued). Mink capture location, animal ID number, sex, and tissue sample data used in contaminant analysis.

ST	WS# ^a	Town	ID #	Sex ^b	Wt(gm)	Moist	Lipid(%)
CT	67	150	87003	1	0.48	64.5	3.54
CT	68	10	85003	1	0.53	66.7	3.16
CT	68	10	85002	1	0.48	66.6	4.93
CT	68	168	85025	1	0.50	66.7	4.29
CT	69	111	86104	1	0.49	64.5	5.80
CT	69	111	87053	1	0.53	65.3	3.36
CT	69	167	86047	1	0.53	64.2	2.19
MA	1	-	89025	1	-	70.0	2.67
MA	1	-	89024	2	-	71.0	3.29
MA	1	-	89031	1	-	73.0	2.39
MA	2	-	89036	1	-	72.0	2.86
MA	2	-	89033	2	-	71.0	3.82
MA	2	-	89026	1	-	71.0	2.82
MA	2	-	89050	1	-	71.0	2.42
MA	2	-	89021	1	-	69.0	2.90
MA	2	-	89051	2	-	71.0	3.30
MA	2	-	89029	1	-	74.0	2.51
MA	4	-	89030	1	-	71.0	3.71
MA	4	-	89037	2	-	71.0	3.12
MA	4	-	89028	2	-	74.0	2.52
MA	5	-	89022	2	-	72.0	4.24
MA	7	-	89019	1	-	68.0	6.44
MA	7	-	89065	2	-	74.0	2.59
MA	7	-	89020	1	-	71.0	6.13
MA	13	-	89046	1	-	72.0	2.33
MA	13	-	89044	1	-	70.0	3.64
MA	19	-	89034	1	-	75.0	4.37
MA	24	-	89066	1	-	75.0	2.13
MA	24	-	89059	1	-	70.0	2.82
MA	25	-	89032	1	-	71.0	3.79
MA	25	-	89071	1	-	70.0	5.07
MA	25	-	89072	2	-	72.0	3.90
MA	25	-	89007	1	-	73.0	2.16
MA	25	-	89070	1	-	67.0	4.73
MA	25	-	89069	1	-	72.0	3.18
MA	28	-	89056	2	-	71.0	2.24
MA	28	-	89067	1	-	68.0	10.50
MA	28	-	89068	1	-	70.0	5.00

^aWatershed Number (see Appendices 1 and 2).

^b1 = male, 2 = female.

Appendix 4. Mercury levels in liver tissue of mink.

Appendix 4. Mercury levels (ppm - wet weight) in liver tissue of mink from Connecticut and Massachusetts.

ST	WS# ^a	ID#	Wt(gm)	Moist	Hg
CT	21	85027	22.6	70.0	6.3
CT	22	85008	9.4	67.7	3.2
CT	31	86049	-	-	-
CT	31	85022	5.4	68.3	4.7
CT	31	87089	31.6	70.5	5.8
CT	31	87030	9.0	68.5	31.0
CT	31	86001	6.9	67.2	18.0
CT	31	86027	31.9	72.2	1.3
CT	31	86046	9.8	65.7	7.0
CT	31	86002	4.2	66.1	17.0
CT	31	86017	13.6	69.9	4.9
CT	31	86085	4.5	67.6	2.9
CT	31	86003	20.0	69.3	1.9
CT	32	87090	-	-	-
CT	32	86092	15.9	66.1	3.5
CT	32	87006	30.9	72.4	2.9
CT	32	86093	19.7	69.0	3.9
CT	32	85005	7.2	65.2	5.9
CT	32	87091	10.1	70.3	4.1
CT	32	86091	5.8	69.1	4.2
CT	32	85028	16.7	67.2	3.4
CT	32	87062	9.7	69.1	3.2
CT	32	87005	10.3	68.3	2.7
CT	33	86025	25.2	68.9	4.8
CT	33	86026	32.8	69.5	5.8
CT	33	87031	7.7	72.1	8.5
CT	34	87018	10.0	67.9	5.4
CT	34	86074	6.7	65.7	6.2
CT	34	86103	28.0	70.2	3.9
CT	34	87017	3.6	67.2	5.9
CT	35	86042	20.2	66.7	10.4
CT	36	86014	17.5	67.3	3.2
CT	36	86019	14.1	71.3	3.2
CT	36	86050	20.1	70.0	5.2
CT	36	87093	20.6	69.1	6.3
CT	37	87020	10.7	71.5	7.5
CT	37	86020	13.3	68.5	2.0
CT	37	87068	41.0	73.1	17.0
CT	37	87064	20.7	71.8	13.0
CT	37	86032	5.1	66.0	2.6
CT	37	86039	22.9	68.4	2.2
CT	37	86086	17.7	70.4	1.8
CT	37	87019	8.8	69.5	3.2
CT	37	87092	14.1	68.7	2.1
CT	37	86028	16.6	70.0	2.2
CT	37	87012	23.0	69.6	2.7
CT	37	87011	23.9	71.5	3.3
CT	37	86100	7.4	67.4	2.8

Appendix 4 (continued). Mercury levels (ppm - wet weight) in liver tissue of mink from Connecticut and Massachusetts.

ST	WS# ^a	ID#	Wt(gm)	Moist	Hg
CT	37	86102	-	-	-
CT	37	88046	11.1	68.8	0.0 ^b
CT	37	87040	5.2	70.2	2.1
CT	38	87026	20.1	69.3	5.3
CT	38	86056	6.9	61.2	3.5
CT	38	85021	9.7	64.5	12.0
CT	38	86041	19.2	66.0	1.2
CT	39	86029	12.5	66.0	0.7
CT	39	86030	13.1	72.7	1.5
CT	40	87094	6.1	72.0	7.9
CT	42	87024	28.1	72.2	2.5
CT	42	87023	23.9	67.3	0.8
CT	42	87025	28.8	69.9	3.8
CT	43	86065	11.9	76.2	2.1
CT	43	86096	4.2	70.1	3.9
CT	43	87082	20.8	74.5	4.8
CT	43	86095	10.9	65.3	4.0
CT	43	85017	12.9	69.4	1.3
CT	43	87083	21.1	71.2	1.1
CT	43	86063	4.2	66.4	16.0
CT	43	87066	23.5	67.6	5.0
CT	43	87046	6.6	71.1	7.0
CT	43	87043	6.7	66.9	7.5
CT	43	86094	6.2	68.7	4.8
CT	43	87029	9.0	69.5	0.5
CT	43	86069	18.5	70.3	2.6
CT	44	86105	16.4	64.8	9.6
CT	47	87032	25.5	70.4	19.0
CT	51	86089	8.9	66.0	8.9
CT	51	87088	-	-	-
CT	52	87084	42.9	72.4	3.9
CT	53	87007	8.8	67.5	1.0
CT	53	87073	5.1	69.6	1.4
CT	53	86040	25.8	72.4	3.3
CT	53	87008	50.8	70.0	2.3
CT	60	85001	18.6	65.6	12.0
CT	60	86064	10.3	71.6	4.4
CT	60	87063	17.6	70.1	1.4
CT	60	88064	-	-	-
CT	60	87041	30.6	69.4	9.6
CT	60	86090	23.7	71.0	1.7
CT	62	87038	20.6	68.2	5.4
CT	62	87039	9.1	68.7	10.4
CT	67	86097	-	-	-
CT	67	87086	14.8	69.9	28.0
CT	67	87004	30.4	71.0	15.0
CT	67	87003	7.6	72.7	1.5
CT	67	87065	22.9	70.1	3.1

Appendix 4 (continued). Mercury levels (ppm - wet weight) in liver tissue of mink from Connecticut and Massachusetts.

ST	WS# ^a	ID#	Wt(gm)	Moist	Hg
CT	67	87059	6.0	65.6	3.2
CT	68	85003	4.2	68.3	10.7
CT	68	85025	15.4	73.2	2.0
CT	68	85002	13.0	68.4	1.0
CT	69	86104	24.7	68.3	1.0
CT	69	86047	-	-	-
CT	69	87053	18.7	71.5	1.4
MA	1	89025	-	-	-
MA	1	89024	-	-	-
MA	1	89031	12.0	67.0	0.0
MA	2	89036	-	-	-
MA	2	89033	-	-	-
MA	2	89026	13.0	69.2	0.9
MA	2	89050	17.0	71.5	0.5
MA	2	89021	11.0	69.1	1.7
MA	2	89051	-	-	-
MA	2	89029	19.0	69.8	1.6
MA	4	89030	-	-	-
MA	4	89037	-	-	-
MA	4	89028	-	-	-
MA	5	89022	-	-	-
MA	7	89019	12.0	67.1	4.1
MA	7	89065	-	-	-
MA	7	89020	11.0	67.2	0.0
MA	13	89046	-	-	-
MA	13	89044	14.0	66.4	3.2
MA	19	89034	13.0	72.8	0.8
MA	24	89066	20.0	71.2	0.4
MA	24	89059	19.0	69.8	0.7
MA	25	89032	16.0	72.5	3.5
MA	25	89071	13.0	67.6	1.5
MA	25	89072	13.0	68.3	1.5
MA	25	89007	14.0	70.6	3.9
MA	25	89070	17.0	92.3	0.0
MA	25	89069	15.0	69.9	1.0
MA	28	89056	-	-	-
MA	28	89067	-	-	-
MA	28	89068	18.	66.2	0.7

^aWatershed ID Number (see Appendices 1 and 2).

^bLower limit of detection = 0.05 ppm.

Appendix 5. Chlordane levels in liver tissue of mink.

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Appendix 5. Chlordane levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05).

ST	WS# ^a	CHLORDANES ^b						TOTAL
		OXC	GC	AC	TNAC	CNAC	HEPEPX	
CT	21	0.06	0.	0.	0.	0.	0.	0.06
CT	22	0.33	0.	0.	0.	0.	0.	0.33
CT	31	0.	0.	0.	0.	0.	0.	0.
CT	31	0.16	0.	0.	0.	0.	0.	0.16
CT	31	0.	0.	0.	0.	0.	0.	0.
CT	31	1.38	0.	0.	0.	0.	0.	1.38
CT	31	1.05	0.	0.	0.	0.	0.	1.05
CT	31	0.08	0.	0.	0.	0.	0.	0.08
CT	31	0.05	0.	0.	0.	0.	0.	0.05
CT	31	0.16	0.	0.	0.	0.	0.	0.16
CT	31	0.10	0.	0.09	0.	0.	0.	0.19
CT	31	0.19	0.	0.26	0.	0.	0.	0.45
CT	31	0.	0.	0.12	0.	0.	0.	0.12
CT	32	0.	0.	0.	0.	0.	0.	0.
CT	32	0.	0.	0.05	0.	0.	0.	0.05
CT	32	0.	0.	0.	0.	0.	0.	0.
CT	32	0.	0.	0.08	0.	0.	0.	0.08
CT	32	0.13	0.	0.	0.	0.	0.	0.13
CT	32	0.	0.	0.	0.	0.	0.	0.
CT	32	0.06	0.	0.07	0.	0.	0.	0.13
CT	32	0.54	0.	0.	0.	0.	0.	0.54
CT	32	0.06	0.	0.	0.	0.	0.	0.06
CT	32	0.08	0.	0.13	0.	0.	0.	0.21
CT	33	0.	0.	0.	0.	0.	0.	0.
CT	33	0.32	0.	0.	0.	0.	0.	0.32
CT	33	0.	0.	0.	0.	0.	0.	0.
CT	34	0.12	0.	0.21	0.	0.	0.	0.33
CT	34	0.	0.	0.15	0.	0.	0.	0.15
CT	34	0.	0.	0.	0.	0.	0.	0.
CT	34	0.09	0.	0.	0.	0.	0.	0.09
CT	35	0.33	0.	0.	0.	0.	0.	0.33
CT	36	0.	0.	0.	0.	0.	0.	0.

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c

Appendix 5 (continued). Chlordane levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05).

ST	WS# ^a	CHLORDANES ^b						TOTAL
		OXC	GC	AC	TNAC	CNAC	HEPEPX	
CT	36	0.	0.	0.05	0.	0.	0.	0.05
CT	36	0.06	0.	0.	0.	0.	0.	0.06
CT	36	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.06	0.	0.	0.	0.06
CT	37	0.21	0.	0.	0.	0.	0.	0.21
CT	37	0.20	0.	0.	0.	0.	0.	0.2
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.25	0.	0.	0.	0.25
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.09	0.	0.	0.	0.	0.	0.09
CT	37	0.	0.	0.08	0.	0.	0.	0.08
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.	0.	0.	0.	0.08	0.	0.08
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	37	0.11	0.	0.	0.	0.	0.	0.11
CT	37	0.	0.	0.	0.	0.	0.	0.
CT	38	0.	0.	0.19	0.	0.	0.	0.19
CT	38	0.07	0.	0.	0.	0.	0.	0.07
CT	38	0.	0.	0.	0.	0.	0.	0.
CT	38	0.	0.	0.06	0.	0.	0.	0.06
CT	39	0.	0.	0.	0.	0.	0.	0.
CT	39	0.09	0.	0.	0.	0.	0.	0.09
CT	40	0.50	0.	0.	0.	0.	0.	0.5
CT	42	0.08	0.	0.11	0.	0.	0.	0.19
CT	42	0.	0.	0.26	0.	0.	0.	0.26
CT	42	0.06	0.	0.05	0.	0.	0.	0.11
CT	43	0.54	0.	0.06	0.	0.	0.	0.6
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	43	0.	0.	0.11	0.	0.	0.	0.11

Appendix 5 (continued). Chlordane levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05).

ST	WS# ^a	CHLORDANES ^b						TOTAL
		OXC	GC	AC	TNAC	CNAC	HEPEPX	
CT	43	0.25	0.	0.10	0.	0.	0.	0.35
CT	43	0.07	0.	0.	0.	0.	0.	0.07
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	43	0.05	0.	0.	0.	0.	0.	0.05
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	43	0.06	0.	0.06	0.	0.	0.	0.12
CT	43	0.25	0.	0.18	0.	0.	0.	0.43
CT	43	0.	0.	0.	0.	0.	0.	0.
CT	44	0.	0.	0.	0.	0.	0.	0.
CT	47	0.15	0.	0.10	0.	0.	0.	0.25
CT	51	0.12	0.	0.11	0.	0.	0.	0.23
CT	51	0.17	0.	0.	0.	0.	0.	0.17
CT	52	0.16	0.	0.06	0.	0.	0.	0.22
CT	53	0.	0.	0.	0.	0.	0.	0.
CT	53	0.12	0.	0.	0.	0.	0.	0.12
CT	53	0.21	0.	0.	0.	0.	0.	0.21
CT	53	0.	0.	0.	0.	0.	0.	0.
CT	60	0.	0.	0.	0.	0.	0.	0.
CT	60	0.09	0.	0.	0.	0.	0.	0.09
CT	60	0.	0.	0.	0.	0.	0.	0.
CT	60	0.30	0.	0.	0.	0.	0.	0.3
CT	60	0.	0.	0.	0.	0.	0.	0.
CT	60	0.	0.	0.13	0.	0.	0.	0.13
CT	62	0.07	0.	0.07	0.	0.	0.	0.14
CT	62	0.07	0.	0.08	0.	0.	0.	0.15
CT	67	0.	0.	0.	0.	0.	0.	0.
CT	67	0.	0.	0.	0.	0.	0.	0.
CT	67	0.	0.	0.	0.	0.	0.	0.
CT	67	0.46	0.	0.	0.	0.	0.	0.46
CT	67	0.	0.	0.	0.	0.	0.	0.

Appendix 5 (continued). Chlordane levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05).

ST	WS# ^a	CHLORDANES ^b						TOTAL
		OXC	GC	AC	TNAC	CNAC	HEPEPX	
CT	67	0.	0.	0.	0.	0.	0.	0.
CT	68	0.27	0.	0.	0.	0.	0.	0.27
CT	68	0.08	0.	0.	0.	0.	0.	0.08
CT	68	0.	0.	0.	0.	0.	0.	0.
CT	69	0.	0.	0.22	0.	0.	0.	0.22
CT	69	0.14	0.	0.13	0.	0.	0.	0.27
CT	69	0.	0.	0.	0.	0.	0.	0.
MA	1	0.04	0.	0.	0.	0.	0.	0.04
MA	1	0.09	0.	0.	0.	0.	0.	0.09
MA	1	0.05	0.	0.	0.	0.	0.	0.05
MA	2	0.02	0.	0.	0.	0.	0.	0.02
MA	2	0.05	0.	0.	0.	0.	0.	0.05
MA	2	0.05	0.	0.	0.	0.	0.	0.05
MA	2	0.03	0.	0.	0.	0.	0.	0.03
MA	2	0.03	0.	0.	0.	0.	0.	0.03
MA	2	0.04	0.	0.	0.	0.	0.	0.04
MA	2	0.03	0.	0.	0.	0.	0.	0.03
MA	4	0.06	0.	0.	0.	0.	0.	0.06
MA	4	0.	0.	0.	0.	0.	0.	0.
MA	4	0.03	0.	0.	0.	0.	0.	0.03
MA	5	0.02	0.	0.	0.	0.	0.	0.02
MA	7	0.06	0.	0.06	0.	0.	0.03	0.15
MA	7	0.05	0.	0.	0.	0.	0.	0.05
MA	7	0.03	0.	0.	0.	0.	0.	0.03
MA	13	0.02	0.	0.	0.	0.	0.	0.02
MA	13	0.07	0.	0.	0.	0.	0.	0.07
MA	19	0.03	0.	0.	0.	0.	0.	0.03
MA	24	0.02	0.	0.	0.	0.	0.	0.02
MA	24	0.03	0.	0.	0.	0.	0.	0.03
MA	25	0.04	0.	0.	0.	0.	0.	0.04
MA	25	0.39	0.	0.	0.	0.	0.06	0.45

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Appendix 5 (continued). Chlordane levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05).

ST	WS# ^a	CHLORDANES ^b						TOTAL
		OXC	GC	AC	TNAC	CNAC	HEPEPX	
MA	25	0.19	0.	0.	0.	0.	0.02	0.21
MA	25	0.	0.	0.	0.	0.	0.	0.
MA	25	0.49	0.	0.	0.	0.	0.05	0.54
MA	25	0.17	0.	0.	0.	0.	0.01	0.18
MA	28	0.07	0.	0.	0.	0.	0.	0.07
MA	28	0.04	0.	0.	0.	0.	0.	0.04
MA	28	0.14	0.	0.	0.	0.	0.	0.14

^aWatershed number (see Appendices 1 and 2).

^bOXC = Oxychlordane, GC = Gammachlordane, AC = Alphachlordane, TNAC = Transnachlor,
CNAC = Cisnachlor, HEPEPX = Heptachlor-epoxide.

Appendix 6. DDT and PCB levels in liver tissue of mink.

Appendix 6. DDT and PCB levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05 for DDE, DDD, and DDT and 0.50 for PCB).

ST	WS# ^a	DDE	DDD	DDT	TOTAL DDT	TOTAL PCB
CT	21	0.08	0.	0.	0.08	2.68
CT	22	0.05	0.	0.	0.05	2.4
CT	31	0.05	0.	0.	0.05	0.
CT	31	0.	0.	0.	0.	0.5
CT	31	0.	0.	0.	0.	0.
CT	31	0.	0.	0.	0.	1.28
CT	31	0.	0.	0.	0.	0.88
CT	31	0.	0.	0.	0.	2.69
CT	31	0.06	0.	0.	0.06	0.
CT	31	0.	0.	0.	0.	0.72
CT	31	0.	0.	0.	0.	3.03
CT	31	0.	0.	0.	0.	2.76
CT	31	0.	0.	0.	0.	4.25
CT	32	0.	0.	0.	0.	0.
CT	32	0.	0.	0.	0.	0.51
CT	32	0.	0.	0.	0.	0.
CT	32	0.	0.	0.	0.	1.44
CT	32	0.	0.	0.	0.	0.
CT	32	0.	0.	0.	0.	0.
CT	32	0.	0.	0.	0.	1.13
CT	32	0.44	0.	0.	0.44	1.31
CT	32	0.	0.	0.	0.	0.59
CT	32	0.	0.	0.	0.	1.36
CT	33	0.	0.	0.	0.	0.74
CT	33	0.10	0.	0.	0.10	1.24
CT	33	0.	0.	0.	0.	4.21
CT	34	0.	0.	0.	0.	1.81
CT	34	0.	0.	0.	0.	2.59
CT	34	0.	0.	0.	0.	0.5
CT	34	0.08	0.	0.	0.08	0.89
CT	35	0.09	0.	0.	0.09	1.85
CT	36	0.	0.	0.	0.	0.
CT	36	0.	0.	0.	0.	1.85
CT	36	0.	0.	0.	0.	1.11
CT	36	0.	0.	0.	0.	2.97
CT	37	0.	0.	0.	0.	11.21
CT	37	0.	0.	0.	0.	2.71
CT	37	0.06	0.	0.	0.06	0.
CT	37	0.	0.	0.	0.	2.89
CT	37	0.	0.	0.	0.	1.86
CT	37	0.	0.	0.08	0.08	1.99
CT	37	0.	0.	0.	0.	4.71
CT	37	0.	0.	0.	0.	2.78
CT	37	0.	0.	0.	0.	1.66
CT	37	0.05	0.	0.	0.05	3.85
CT	37	0.	0.	0.	0.	3.16

Appendix 6 (continued). DDT and PCB levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05 for DDE, DDD, and DDT and 0.50 for PCB).

ST	WS# ^a	DDE	DDD	DDT	TOTAL DDT	TOTAL PCB
CT	37	0.	0.	0.	0.	0.
CT	37	0.	0.06	0.	0.06	4.95
CT	37	0.	0.	0.	0.	0.
CT	37	0.13	0.	0.	0.13	1.38
CT	37	0.06	0.	0.	0.06	0.
CT	38	0.	0.	0.	0.	1.66
CT	38	0.	0.	0.	0.	2.41
CT	38	0.	0.	0.	0.	2.29
CT	38	0.	0.	0.	0.	0.75
CT	39	0.	0.	0.	0.	1.53
CT	39	0.10	0.	0.	0.1	3.25
CT	40	0.10	0.	0.	0.1	5.04
CT	42	0.	0.	0.	0.	1.12
CT	42	0.	0.	0.	0.	2.92
CT	42	0.10	0.	0.	0.1	1.11
CT	43	0.38	0.05	0.	0.43	0.95
CT	43	0.	0.	0.	0.	0.
CT	43	0.	0.	0.	0.	1.70
CT	43	0.12	0.	0.	0.12	1.56
CT	43	0.	0.	0.	0.	0.
CT	43	0.	0.	0.	0.	1.18
CT	43	0.06	0.	0.	0.06	0.
CT	43	0.09	0.	0.	0.09	0.
CT	43	0.	0.	0.	0.	0.5
CT	43	0.	0.	0.	0.	0.
CT	43	0.	0.	0.	0.	0.51
CT	43	0.06	0.	0.	0.06	2.16
CT	43	0.	0.	0.	0.	0.
CT	44	0.	0.	0.	0.	0.57
CT	47	0.09	0.	0.	0.09	0.99
CT	51	0.05	0.	0.	0.05	0.89
CT	51	0.	0.	0.	0.	1.46
CT	52	0.18	0.	0.	0.18	1.13
CT	53	0.08	0.	0.	0.08	0.96
CT	53	0.08	0.	0.	0.08	0.
CT	53	0.	0.	0.	0.	10.09
CT	53	0.18	0.	0.	0.18	1.81
CT	60	0.06	0.	0.	0.06	0.
CT	60	0.05	0.	0.	0.05	0.
CT	60	0.	0.	0.	0.	1.37
CT	60	0.05	0.	0.	0.05	0.
CT	60	0.05	0.	0.	0.05	0.6
CT	60	0.	0.	0.	0.	1.55
CT	62	0.	0.	0.	0.	2.65
CT	62	0.	0.	0.	0.	1.25
CT	67	0.	0.	0.	0.	0.

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 Appendix 6 (continued). DDT and PCB levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05 for DDE, DDD, and DDT and 0.50 for PCB).

ST	WS# ^a	DDE	DDD	DDT	TOTAL DDT	TOTAL PCB
CT	67	0.12	0.	0.	0.12	0.88
CT	67	0.06	0.	0.	0.06	0.
CT	67	0.	0.	0.	0.	0.
CT	67	0.06	0.	0.	0.06	1.13
CT	67	0.	0.	0.	0.	0.5
CT	68	0.05	0.	0.	0.05	0.94
CT	68	0.06	0.	0.	0.06	0.
CT	68	0.	0.	0.	0.	0.89
CT	69	0.	0.	0.	0.	1.95
CT	69	0.	0.	0.	0.	1.04
CT	69	0.10	0.	0.	0.1	2.47
MA	1	0.02	0.	0.	0.02	0.
MA	1	0.01	0.	0.	0.01	0.
MA	1	0.02	0.	0.	0.02	0.61
MA	2	0.02	0.	0.	0.02	0.
MA	2	0.05	0.	0.	0.05	0.
MA	2	0.01	0.	0.	0.01	0.
MA	2	0.01	0.	0.	0.01	0.
MA	2	0.02	0.	0.	0.02	0.
MA	2	0.02	0.	0.	0.02	0.62
MA	2	0.01	0.	0.	0.01	0.
MA	4	0.01	0.	0.	0.01	1.9
MA	4	0.13	0.	0.	0.13	0.44
MA	4	0.03	0.	0.	0.03	0.
MA	5	0.04	0.	0.	0.04	0.
MA	7	0.10	0.01	0.	0.11	4.1
MA	7	0.06	0.	0.	0.06	0.65
MA	7	0.05	0.	0.	0.05	0.
MA	13	0.02	0.	0.	0.02	0.
MA	13	0.01	0.	0.	0.01	1.5
MA	19	0.09	0.	0.	0.09	0.
MA	24	0.02	0.	0.	0.02	0.37
MA	24	0.02	0.	0.	0.02	0.44
MA	25	0.10	0.06	0.	0.16	0.43
MA	25	0.10	0.	0.	0.1	0.88
MA	25	0.07	0.	0.	0.07	0.54
MA	25	0.	0.	0.	0.	0.
MA	25	0.11	0.	0.	0.11	1.99
MA	25	0.07	0.	0.	0.07	0.83
MA	28	0.03	0.	0.	0.03	1.57
MA	28	0.01	0.	0.	0.01	0.
MA	28	0.07	0.	0.	0.07	0.47

^aWatershed number (see Appendices 1 and 2).

Appendix 7. Dieldrin, endrin, and mirex levels in liver tissue
of mink.

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 Appendix 7. Dieldrin, Endrin, and Mirex levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05).

ST	WS # ^a	DIELDRIN	ENDRIN	MIREX
CT	21	0.	0.	0.
CT	22	0.10	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.06	0.	0.
CT	31	0.14	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	31	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	32	0.	0.	0.
CT	33	0.	0.	0.
CT	33	0.33	0.	0.
CT	33	0.	0.	0.
CT	34	0.	0.	0.
CT	34	0.	0.	0.
CT	34	0.	0.	0.
CT	34	0.	0.	0.
CT	34	0.	0.	0.
CT	35	0.10	0.	0.
CT	36	0.	0.	0.
CT	36	0.	0.	0.
CT	36	0.	0.	0.
CT	36	0.	0.	0.
CT	37	0.18	0.	0.
CT	37	0.06	0.	0.
CT	37	0.	0.	0.
CT	37	0.11	0.	0.
CT	37	0.	0.	0.
CT	37	0.	0.	0.
CT	37	0.	0.	0.
CT	37	0.19	0.	0.
CT	37	0.	0.	0.
CT	37	0.18	0.	0.
CT	37	0.	0.	0.
CT	37	0.	0.	0.

Appendix 7 (continued). Dieldrin, Endrin, and Mirex levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05 for DDE, DDD, and DDT and 0.50 for PCB).

ST	WS# ^a	DIELDRIN	ENDRIN	MIREX
CT	37	0.05	0.	0.08
CT	37	0.	0.	0.
CT	37	0.14	0.	0.
CT	37	0.	0.	0.
CT	38	0.	0.	0.
CT	38	0.	0.	0.
CT	38	0.15	0.	0.
CT	38	0.	0.	0.
CT	39	0.	0.	0.
CT	39	0.	0.	0.
CT	40	0.08	0.	0.
CT	42	0.	0.	0.
CT	42	0.	0.	0.
CT	42	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	43	0.	0.	0.
CT	44	0.	0.	0.
CT	47	0.	0.	0.
CT	51	0.	0.	0.
CT	51	0.06	0.	0.
CT	52	0.08	0.	0.
CT	53	0.	0.	0.
CT	53	0.	0.	0.
CT	53	0.	0.	0.
CT	53	0.	0.	0.
CT	60	0.	0.	0.
CT	60	0.	0.	0.
CT	60	0.	0.	0.
CT	60	0.	0.	0.
CT	60	0.	0.	0.
CT	60	0.	0.	0.
CT	62	0.	0.	0.
CT	62	0.	0.	0.
CT	67	0.	0.	0.
CT	67	0.	0.	0.
CT	67	0.	0.	0.

Appendix 7 (continued). Dieldrin, Endrin, and Mirex levels (ppm - wet weight) in mink livers. Zeros indicate none detected (LLD = 0.05 for DDE, DDD, and DDT and 0.50 for PCB).^b

ST	WS# ^a	DIELDRIN	ENDRIN	MIREX
CT	67	0.	0.	0.
CT	67	0.	0.	0.
CT	67	0.	0.	0.
CT	68	0.09	0.	0.
CT	68	0.	0.	0.
CT	68	0.	0.	0.
CT	69	0.	0.	0.
CT	69	0.	0.	0.
CT	69	0.06	0.	0.06
MA	1	0.01	0.	0.
MA	1	0.02	0.	0.
MA	1	0.	0.	0.
MA	2	0.	0.	0.
MA	2	0.	0.	0.
MA	2	0.	0.	0.
MA	2	0.	0.	0.
MA	2	0.	0.	0.
MA	2	0.	0.	0.
MA	2	0.	0.	0.
MA	4	0.01	0.	0.
MA	4	0.	0.	0.
MA	4	0.	0.	0.
MA	5	0.01	0.	0.
MA	7	0.	0.	0.
MA	7	0.	0.	0.
MA	7	0.	0.	0.
MA	13	0.	0.	0.
MA	13	0.01	0.	0.
MA	19	0.	0.	0.
MA	24	0.	0.	0.
MA	24	0.01	0.	0.
MA	25	0.12	0.	0.
MA	25	0.08	0.	0.
MA	25	0.16	0.	0.
MA	25	0.21	0.	0.
MA	25	0.06	0.	0.
MA	25	0.06	0.	0.
MA	28	0.02	0.	0.
MA	28	0.02	0.	0.
MA	28	0.06	0.	0.

^aWatershed number (see Appendices 1 and 2).

^b0.01 ppm LLD for MA samples.

Appendix 8. Chemical analysis methods used for this study.



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NITRIC REFLUX DIGESTION FOR MERCURY

Approximately 0.5 g. of sample was weighed into a freshly cleaned 50 ml. round bottom flask with 24/40 ground glass neck. For waters, 10 ml. of sample were measured into the flask. Five ml. of concentrated sub-boiled HNO_3 were added and the flask was placed under a 12 inch water-cooled condenser with water running through the condenser. The heat was turned up to allow the HNO_3 to reflux no more than 1/3 the height of the columns. Samples were allowed to reflux for two hours. Then the heat was turned off and the samples allowed to cool. The condensers were rinsed with 1% v/v HCl and the flasks removed. The samples were diluted with 1% v/v HCl in a 50 ml. volumetric flask and then transferred to clean, labeled, 2 oz. flint glass bottles.



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MERCURY - COLD VAPOR ATOMIC ABSORPTION

Equipment used for Cold Vapor Atomic Absorption include: Perkin-Elmer Model 403 AA; Perkin-Elmer Model 056 recorder; Technicon Sampler I; Technicon Pump II; a glass cell with quartz windows and capillary tube for entry and exit of the mercury vapor; and a liquid-gas separator. The samples were placed in 4 ml. sample cups at least 3/4 full. The samples were mixed with hydroxylamine for preliminary reduction, then stannous chloride for reduction to the mercury vapor. The vapor was separated from the liquid and passed through the cell mounted in the light path of the burner compartment. The peaks were recorded and the peak heights measured. The standardization was done with at least 5 standards in the range of 0 to 10 ppb. The correlation coefficient was usually 0.9999 or better and must have been at least 0.999 to have been acceptable. A standard was run every 8-10 samples to check for drift in the standardization. This was usually less than 5%. Standards were preserved with 10% v/v HNO₃, 1% v/v HCl and 0.05% w/v K₂Cr₂O₇. The solution concentrations were calculated and the data entered into the AA calculation program which corrected for blank, dilution, sample weight, sample volume and entered the data into the LIMS system for report generation.

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The sediment samples were freeze-dried and extracted in a Soxhlet extraction apparatus. A flow diagram of the procedure is attached. Briefly, the freeze-dried sediment samples were homogenized and a 10-gram sample was weighed into the extraction thimble. Surrogate standards and methylene chloride were added and the samples extracted for 12 hrs. The extracts were treated with copper to remove sulfur and were purified by silica/alumina column chromatography (MacLeod *et al.*, 1985; Brooks *et al.*, 1989) to isolate the aliphatic and aromatic/pesticide/PCB fractions.

The tissue samples were extracted by the NOAA Status and Trends Method (MacLeod *et al.*, 1985) with minor revisions (Brooks *et al.*, 1989; Wade *et al.*, 1988). A flow diagram of the procedure is attached. Briefly, the tissue samples were homogenized with a Teckmar Tissumizer. A 1 to 10-gram sample (wet weight) was extracted with the Teckmar Tissumizer by adding surrogate standards, Na₂SO₄, and methylene chloride in a centrifuge tube. The tissue extracts were purified by silica/alumina column chromatography to isolate the aliphatic and PAH/pesticide/PCB fractions. The PAH/pesticide/PCB fraction was further purified by HPLC in order to remove interfering lipids.

The quantitative analyses were performed by capillary gas chromatography (CGC) with a flame ionization detector for aliphatic hydrocarbons, CGC with electron capture detector for pesticides and PCB's, and a mass spectrometer detector in the SIM mode for aromatic hydrocarbons (Wade *et al.*, 1988).

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TISSUE EXTRACTION / PURIFICATION

